

**ATTACHMENT G: BACKGROUND INFORMATION ON OMB BUDGET
INFORMATION SYSTEMS**

1. HARDWARE/COMMUNICATIONS

The systems used to operate the Budget Systems run on four architectures.

A. Budget System mainframe application components operate at a remote commercial computing facility offering OS/390 services. The master Budget System database is located on this platform where most batch reports are generated. A dedicated high-speed communications link to the remote computing facility enables OMB to integrate the services performed on the mainframe with the local Budget System processes operating on the desktop and on distributed system platforms.

B. A RS/6000 distributed system platform located at EOP is used to host the primary A-11 server functions. It is also home to the A-11 distributed data base, where among other tasks, it feeds updates to the master Budget System database on the mainframe.

C. OMB workstations are all Intel based systems operating Windows NT. Approximately 700 federal agency users connecting to the Budget Systems over the Internet operate custom software developed for A-11. Like at OMB, these systems are all Intel based. Unlike OMB, they may use any current Microsoft Windows version; currently Windows 98, Windows 2000, and Windows ME.

D. Regulatory Management and Regulation Tracking Systems mainframe application components operate at the EOP offering OS/390 services.

As a foundation, all offices within the EOP communicate to systems over a high-speed Ethernet based backbone. Depending upon location and special requirements, PC's link to the EOP LAN on Ethernet or Fast-Ethernet links. Most all server systems, such as the OMB RS/6000 servers, connect to the backbone with a minimum of 100-megabit connections. Protected with firewall technology, the EOP also links to the Internet over high-speed connections.

A variety of TCP/IP protocols are used to connect to the host and server systems. Most basic Budget System access and processing performed on these user systems are through custom written programs using standard TCP/IP protocols for integrating function with the mainframe and distributed system. The protocols include the use of TELNET, FTP, NFS, REXEC, and HTTP.

2. HARDWARE AND SOFTWARE CURRENTLY IN USE

The mainframe applications run using TSO or batch, IBM Clists, JCL, DB2 RDBMS SQL, Easytrieve, ISPF, the Dialog Management Services Facility and COBOL. There are also several PC based components which use Microsoft Windows, VisualBasic, C++, DynaComm, Microsoft Excel, Exceed and various other software packages that fit the need of the application at the time of development. RS/6000 workstations run the AIX operating system and the DB2 Universal Database (UDB) for UNIX relational database. Middleware consists of ODBC and custom applications, as well as TCP/IP protocols.

3. OMB BUDGET SYSTEMS AND RELATED TOOLS

Currently there are several complex software systems in use which perform key functions in the production of the Budget of the U.S. Government, and in automated information decision support for OMB policy officials. These systems provide facilities for data capture, storage manipulation and reporting of budget-related information. They are subject to varying amounts of adaptive, corrective and perfective maintenance. These modifications are performed under severely compressed time frames and there is little tolerance for errors. These systems primarily use the DB2 RDBMS for the data repository.

3.1 Functions Required of OMB Budget Systems

OMB Budget applications and their related tools are designed to carry out one or more of the following functions:

- A. Collect and Maintain Budget Data
This function focuses on the process of capturing, storing, and maintaining budget information. Inherent in this function are data validation (edits), audits, and security controls. This function consists of four sub-functions:
 - Import/Export Data
 - Data Entry/Update
 - Transfer Data
 - Archive/Restore Data

- B. Analyze data and provide Decision Support
This function focuses on the process of preparing the data for user analysis. This preparation process consists of four sub-functions:
 - Select Data
 - Manipulate Data
 - Create Temporary Data
 - Aggregate and Compare Data

- C. Generate Reports and other Output of Budget Data in a variety of ways
This function focuses on the process of presenting budget information in a printed hard-copy report or displaying the information online. This function consists of four sub-functions:
 - Select Data
 - Format Output
 - Create and Distribute Reports
 - Archive/Restore Reports

- D. Publish Data
This function focuses on the process of preparing information for publishing. Budget information is merged with text in a highly stylized format that is required for printing at the Government Printing Office (GPO). It includes the following sub-functions:

- Extract data from various electronic sources
 - Reformat or restructure data as necessary
 - Convert data to format needed for typesetting (or other means of publishing)
- E. Analytical Modeling
This function focuses on the use of analytical systems to model the effects of policy decisions on program costs.
- F. User data administration
This function allows a special group of users to focus on designing and redesigning data and rapidly obtaining information about the nature of the data.
- G. Information Systems
This function provides programming support and technical assistance for the daily operation of the Reports Management System (RMS) and the Regulation Tracking System (REGS) Model 204 applications including maintenance and incremental system improvements, and for the migration of these Model 204 applications to a successor system.

The following OMB Budget Applications are detailed below:

3.2. MAX A-11 Data Entry System (MAX A-11)

The MAX A-11 Data Entry System performs the functions of collecting, verifying and maintaining budget data through a remote data entry process involving almost all agencies of the United States Government, and the generation of budget output in a number of ways, mostly through reports.

The system is a client-server application that does not require a persistent connection between the client and server. The server transfers data via the Internet between a central DB2 database and files on the client so users can update their budget data without having to be connected to the server.

Data transferred between the federal agencies – 300 separate entities with approximately 700 separate users -- and the MAX A-11 System is accomplished using Internet protocols. Users within OMB communicate with the system via the EOP intranet (LAN).

3.2.1 Components of the MAX A-11 Data Entry System

- A. A-11 Data Entry Windows-based software

A-11 Data Entry Windows-based software is the client application used by federal agencies to enter budget data. The software is designed with a spreadsheet-like interface and a user-friendly display. The program validates data being entered and also automatically generates portions of budget information (e.g., projections of cost estimates beyond

the budget year).

B. A-11 Dispatcher software

The A-11 Dispatcher program is the server component of the MAX A-11 Data Entry System. It runs on the UNIX host server platform and listens for connections originating from client programs and spawns a server process for each connection. Each server process executes requests from the client program such as the downloading of budget data and uploading of data from the client workstation.

C. A-11 Server Host programs

Server processes spawned by the A-11 Dispatcher program call up specific programs that run on the server host (UNIX) platform based on requests coming from the client program. These programs perform the following functions:

1. Extract budget account data from the MAX DB2 central database and format it into a flat file for downloading to the client workstation.
2. Update the MAX DB2 central database with account data transferred from the client workstation.
3. Retrieve descriptions of accounts from the MAX DB2 central database for display by the client program.
4. Store user information transferred from the client program into the MAX DB2 database.
5. Request a report be run on the SunGard, IBM mainframe and have the output sent to the client workstation.
6. Request news from the MAX DB2 central database.

D. A-11 Dispatcher Manager

A Windows based program that allows the scheduling of the hours of operation of the A-11 Dispatcher, displays entries into the log of transactions kept by the Dispatcher, and performs other functions related to the administration of the server program. This program is accessible only to MAX A-11 administrators.

E. Lock Rules Application

A Windows based program that allows administrators to place locks (restrictions on updates) on records in the MAX Database. These locks are enforced through the use of

triggers stored in the database. Administrators can not only create locks on data with this application but can also give specific users or accounts access (i.e., update authority) to data locked by lock rules.

F. A-11 Utility Programs

A number of programs exist on the Unix server platform which are not called up by the Dispatcher. These programs are run by MAX A-11 administrators to perform database-wide validation checks or to generate data for out-year calculations.

3.2.2 MAX - A-11 Data Entry Systems: Technical Description

Communications between the A-11 client program and the server (Dispatcher) are made using the TCP/IP, Telnet and BSD Sockets protocol. The client program establishes a connection with the EOP network via a firewall using an RSA ACE authentication process. Users must not only enter their logon id and password but also their RSA SecurID pin number and token. Once the user has entered this information the client program navigates through the Internet, through the EOP firewall and establishes a connection with the server platform transparently to the user. The client program uses Telnet commands to establish the initial connection. The server program (Dispatcher) listens at a specific port at its IP address and accepts all valid communications from the client program. It then spawns independent processes that deal with requests from the client program.

The table below shows technical information pertinent to each of the MAX A-11 components described above:

Comp.	Platform	Code Base	Lines of Code	Software Utilized	Dependencies
A-11 Data Entry	Windows 98, NT	Visual C++ 6.0	83,000	Visual Studio Microsoft Foundation Classes NUMEGA Bounds Checker	Winsock.DLL
A-11 Dispatcher	AIX (UNIX) on RS/6000	IBM C++	40,000	IBM C++ Compiler Unix Utilities	
A-11 Server Host programs	AIX (UNIX) on RS/6000	COBOL	172,000	Microfocus COBOL	
A-11 Dispatcher Manager	Windows NT	Visual C++ 6.0	8,200	Visual Studio Microsoft Foundation Classes NUMEGA Bounds Checker	
Lock Rules Application	Windows NT	Visual C++ 6.0	7,500	Visual Studio Microsoft Foundation Classes	

				NUMEGA Bounds Checker	
A-11 Utility Programs	AIX (UNIX) on RS/6000	IBM C++	227,328	Microfocus COBOL	

3.2.3 Usage Patterns

The data collection cycle for A-11 Data Entry is heavily oriented to the collection, assembly and production of the budget document. This effort has traditionally occurred from November of each year to the delivery of the materials to the Government Printing Office (GPO) in late-January. During this cycle approximately 176,000 records are processed. Data is received from over 2000 separate budget accounts submitted by over 120 agencies. There is a secondary usage cycle in June/July for data collection as part of a Mid-Session Review. During this cycle only about 21,000 records are processed. In addition, because the A-11 Data Entry system is designed for flexibility in the collection of data from various internal and external sources, it is also utilized for various budget exercises including the collection of data for agency budget requests, R&D and Financial Management system exercises in addition to the President's Budget.

3.2.4 Workload Requirements

There will be two sets of workload requirements for the MAX A-11 Data Entry System – annual maintenance / upgrades and new initiatives. Annual maintenance and upgrades include enhancements made to the software, changes in software as the result of changed information requirements and corrections of software malfunctions. These modifications occur on a cyclical basis beginning with the end of budget season. A list of software modifications will be compiled from user surveys and from an analysis of anticipated requirements for the upcoming budget year. The contractor will provide advice as to the feasibility and estimated man-hours required to complete each modification. Modifications must be completed in such time as to allow adequate testing before a new version of the A-11 software is released at the beginning of September each year. The government will select which software modifications will be undertaken and approve all schedules and workload estimates provided by the contractor.

There are no exact workload estimates for development under new initiatives, including modernization of MAX A-11 communications and collection of Appendix text. However, it is estimated that the amount of C++ code for the A-11 Data Entry and A-11 Host Server components may double if these initiatives are undertaken.

3.3 MAX – Mainframe Decision Support System (MAX - DSS)

3.3.1 The MF MAX Decision Support System is used:

- By technically sophisticated staff to undertake decision support activities in response to the needs of OMB policy officials.

- To provide hundreds of reports for OMB staff to analyze and validate data collected through the MAX A-11 system, appropriations bill tracking, and other ad hoc sources.

3.3.2 The major components of DSS are:

- Data Query and Data Update
- Reports
- Data Exchange Facilities with CBO

There are approximately two million lines of Easytrieve production code.

3.3.3 Date Query and Data Update

The data query and data update components of DSS allow OMB staff to query and update the primary budget databases. The query facility is 'free-form' in nature, making it very flexible, but at the same time making it difficult for non-technical staff to learn.

Data update is divided into two components, Single/Multiple record update, and Global. Using single/multiple, staff can retrieve and view up to 200 records in the database, and have substantial flexibility to look at any of 100 fields which make up a record. The global facility allows staff to copy or modify larger numbers (up to 50,000) of records, and provides a variety of capabilities for allowing staff to change the values of records.

Staff have the ability to create, store and recall queries on demand.

3.3.4 Reports

DSS is equipped with both custom reports which typically cull data from a DB2 database, aggregate and sort the data using complex programs, and produce output which may be summary, detail or exception in nature. The JCL job stream for a report can have only one significant step in which data is extracted and reported upon, or it can have up to 6 job steps which read, sort, aggregate and otherwise manipulate data.

DSS reports also have the capability of updating a variety of DB2 databases, sequential files and PDS members.

Non-technical staff can easily run Canned Reports which were previously created. Canned Reports typically have screens which ask a user to fill in the blanks, e.g., type in the heading for the report, type in a response so the report is sorted in a particular order, etc. Technically sophisticated staff can create and run Custom Reports. One difference between Custom and Canned Reports is that Custom Reports typically do not provide user friendly instructions.

As with data query and update, staff have the ability to create, store and recall report specifications on demand.

3.3.5 Data Exchange Facilities with CBO

DSS is also used to exchange data and reports between OMB and the Congressional Budget Office (CBO). Data from CBO is copied over high speed communication lines, and is processed by programs which insert the data into OMB's MAX database. Reports are also sent in the same fashion. In addition, OMB data and reports are also sent to CBO.

3.3.6 Technical Description of DSS

MAX DSS is a TSO application. The on-line programs are written using COBOL. Programs run in batch are comprised of both COBOL and Easytrieve Plus. As a TSO application, DSS uses Clists, skeletons, ISPF panels, JCL, and REXX execs.

A set of MAX DSS client-server tools is also available. These tools include Decision Support Workbench and others under development are designed to replicate components of MAX DSS using a friendlier graphical user interface. The client-server MAX DSS components are written primarily in Visual Basic.

3.4 MAX Database

The MAX database supports a combination of custom developed and COTS applications used for analysis and the development of the President's budget. The MAX database consists of several databases containing hundreds of tables. The MAX database uses DB2 and operates in an OS/390 and RS/6000 UNIX environment. It also relies on the data propagation function of DB2 to keep data synchronized across the two platforms.

3.4.1 Components of the MAX Database

a. Multiple databases structures

The MAX database environment consists of the following databases:

1. MAX006P – tables of production budget data used to support the analysis and production of the President's budget.
2. OBJ001P – tables that define functions and characteristics used in MAX applications.
3. OSD001P – tables used to collect data for ad hoc budget exercises.
4. ODD001P – temporary tables used by various MAX applications.
5. OLT001P – tables used as domain information for pick lists in MAX applications.

b. Database Administration Programs

There are a variety of custom programs used to maintain the MAX database. They are primarily written using JCL , COBOL, and use Computer Associates Platinum utilities. A few are written in Easytrieve. These programs support the following types of activities:

- Dynamic unload programs containing various retention periods depending on whether it represents daily, weekly, or monthly backups.
- Unload programs used to archive the President’s budget for a ten-year period.
- Programs to support maintenance on the primary budget data table. These programs provide capabilities to archive subsets of data and renumber row numbers used as a key.
- Other maintenance programs used to do standard maintenance activities such as reorgs, runstats, archiving database objects, etc.

3.4.2 MAX – Database Technical Description

Platform	Version	Size
RS/6000 UNIX	DB2 UDB 6	10 gigabytes
OS/390	DB2 UDB 6	20 gigabytes

Production Database Objects (OS/390)

Tables	Views	Indexes
835	921	1,032

3.4.3 Usage Patterns

The database is actively used all year around. However, there is a particularly heavy period each year when the President’s budget is being developed. This time period is generally November through January. During this time the database is accessed by approximately 600+ users and includes a large volume of updates.

3.4.4 Workload Requirements

The work required is to analyze the impact of requested changes to the DB2 database, implement database changes that have been approved by OMB, perform general data base administration including performance monitoring, and support the maintenance of DB2 and DB2 related products. Our current data model is fairly stable. In an average year we need to add 15 new tables and alter the definition of 20 tables.

3.5 Batch Processing and Reporting

Another important feature common to many OMB budget and related systems is batch processing and reporting. This capability is vital to the MAX -DSS system as well as the A-11 Data Entry software versions. A-11 Data Entry includes a mode where remote and internal users

enter the batch processing environment via terminal mode from their personal computer. A replacement for this mode is being sought as part of a communications improvement plan.

Reports are run during the day in batch based on the specifications the user gives to the on-line system. The ISPF Dialog Manager and file-tailoring capabilities are used to generate user-specified batch report jobs. Reports can be printed immediately or held for on-line viewing, with printing done later at the option of the user.

During major peak production periods, a nightly processing cycle is run which is comprised of a number of different processes, including report generation similar to that done during the day, and loading of data from external sources. These are time-critical processes.

There are over 500 COBOL and Easytrieve programs which serve to control nightly processing of source data, to update the master files, and to control the production of output reports to users within OMB. Because of the large variation possible in nightly report production (types of accounts, agencies, number of recipients and copies), a TSO-based subsystem is used to tailor the number of jobs that will be run, the copies produced, etc. Problems with on-call overnight production jobs are directed to production support on-call contractor staff. The on-call contractor staff will look at the problem proceed with resolution and direct the SunGard Production control group.

3.6 Appendix and BAA Preparation Systems

Several systems have been developed to assist the Office of Management and Budget in publishing the Budget of the United States Government. The preparation of financial data and text for submission to GPO Photocomposition equipment is a multi-step process which involves two major components:

- The Budget Appendix Printing System which creates text and table galleys.
- The BAA System (Budget by Agency and Account) or "Federal Program by Agency and Account" (FPAA); which creates several specialized reports as well as specialized extract files on the mainframe which are then transferred to the PC for processing.

3.6.1 Appendix Printing System

The data in the budget files must be arrayed for presentation to the Congress. The budget appendix generation process is divided between two computer application processing platforms: RS/6000 and PC. The creation of a budget appendix chapter is performed on the RS/6000 using C++ programs and the DB2 database management system. The printing of a budget appendix chapter is performed on the PC using a Windows VisualBasic program, a text editor (SED) program, batch files, and the GPO Microcomp System (a DOS based application).

The Appendix Printing system produces text and table galley reports as well as PC files which are oriented to the Government Printing Office's (GPO) device characteristics and control. Files produced often include GPO Microcomp code (a pseudo-postscript code) as well as other special

requirements.

The downloading processing involves 6.6 megabytes of data which after preparation on the PC systems are reviewed in detail and proofed before final submission to GPO. The Appendix Printing System requires a high level of maintenance and operations support from technical staff.

3.6.2 The Budget by Agency and Account (BAA) or "Federal Program by Agency and Account (FPAA)" Systems

This system is composed of two parts; one which creates specialized extract files on the mainframe which are then transferred to the PC for Photocomposition processing, the second creates several specialized reports which can have user selected criteria. The system is written to use a Batch COBOL program to extract data and create a sequential file. The file is then downloaded to the PC Photocomposition System. A second Batch COBOL program generates reports with user selected criteria from the extract file. The BAA (FPAA) system requires a high level of maintenance and operations support from technical staff.

3.7 User Data Administration Tools

There are several data administration tools which provide access for data redesign and manipulation which provide capabilities to the special users. They are also built on the client/server model. Some representative examples are:

3.7.1 MAX Rule Builder

MAX Rule Builder is a Windows-based adjunct product to the A-11 Data Entry system. It allows special users quick access to reengineering edit rules that are a major component of the A-11 Data Entry system. The changing and editing of rules is often a dynamic activity in the formulation of the budget process.

3.7.2 MAX Account Builder

MAX Account Builder is Windows-based database tool used by special users for the addition and major changes of budget accounts.

3.7.3 MAX Access Builder

MAX Access Builder is a Windows-based tool designed to assist certain users in defining access rights used by applications to determine access rights to specific data in DB2 tables.

3.7.4 MAX Security

MAX Security is a C++ application which controls access to MAX database and provide users administration abilities.

3.8 Budget Execution

3.81. The Budget Execution system enables OMB to use Department of Treasury accounting data for analytical, reporting, and publication activities. This task will provide for the development of new modules and ongoing maintenance activities associated with the support of this system.

- develop, maintain and document programs to load Treasury accounting data into OMB's DB2 database, including a portion of the database that underlies the President's Budget
- develop, maintain, and document programs to present Treasury accounting data in the format of OMB Circular A-34's SF133 Report on Budget Execution
- develop, maintain and document programs to present Treasury accounting data in the format of OMB Circular A-11's Program & Financing Schedule
- develop programs that highlight potential inconsistencies in accounting data reported by the agencies
- develop programs, procedures and routines to facilitate migrating report output in MVS data sets to PDF and HTML files that are used on Intra and/or Internet servers